FOND DU LAC RESERVATION TRIP REPORT

Assessment of Mold and Moisture Conditions

Final Report

Date:
May 2, 2003

Prepared for:
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Office of Native American Programs

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INTERIM REPORT

Due to a probable return site visit to Fond Du Lac Reservation, the Trip Report lists problems identified in the properties visited. Appendix B includes a detailed summary of each property. The Technical Report will be completed after a second visit to be scheduled.

PART I

FOND DU LAC RESERVATION TRIP REPORT

INTRODUCTION

Kate Brown from the Building Research Council (BRC) at the University of Illinois Urbana-Champaign and Robert Nemeth from Magna Systems conducted a site visit at Fond Du Lac Housing Authority on May 2, 2003. The Fond Du Lac Housing Authority administers the housing program for the Fond Du Lac Tribe. The purpose of the site visit was to provide technical assistance to the housing authority in assessing mold and moisture conditions in housing units. This report summarizes activities and issues addressed while on site. A detailed analysis of the findings and recommendations will be included in a follow-up report that will be issued after the next site visit.

BACKGROUND INFORMATION

The Fond Du Lac Reservation is located in Carlton and St. Louis Counties in the westernmost tip of Lake Superior in the State of Minnesota. The area is home to hundreds of lakes, miles of rivers, and thousands of acres of rolling forestland. The average annual precipitation is 30 inches. The average annual snowfall is about 77.6 inches. The average July maximum temperature is about 77.1° F and the average minimum temperature in January is approximately -2.2° F. An estimated 7,557 Native Americans reside on the Fond Du Lac Reservation. The housing authority maintains 237 Low Rent homes and 114 Mutual Help homes for the Tribe.

Wayne Dupuis, Executive Director of the Fond Du Lac Housing Authority, requested technical assistance and training on mold and moisture problems impacting a sixteen unit senior housing complex and homes on the reservation. The team inspected the Sawyer Elderly Center, a senior housing complex and two Low Rent homes. The two inspected homes were stick built with three bedrooms each. One home was ranch style and one other home was split-level style. Propane provided the primary source of heat. The primary heating source for the senior housing complex was electric baseboards. The Sawyer Elderly Center was seven years old and each home was twenty years old.

Day 1: Friday, May 2, 2003

On Friday morning, the assessment team met with Wayne Dupuis, Executive Director, and Kelly Diver, Maintenance Supervisor, to discuss mold and moisture issues and the site visit schedule.

Wayne Dupuis, Kelly Diver and Dewey Dupuis, maintenance staff, accompanied the assessment team during the morning inspections of the Sawyer Elderly Center and two homes. Digital photographs recorded conditions at each inspection site. The inspection process involved visual assessments of both interior and exterior conditions and discussion with available residents. *PART II: Technical Housing Assessment Report: Examining Mold and Moisture Conditions of Homes on the Fond Du Lac Reservation*, to be issued after the next site visit, will provide a detailed analysis of findings and recommendations for the homes investigated on the Reservation.

FINDINGS

An overview of findings for the site visit follows. Refer to the individual write-ups for a more detailed discussion and analysis of the principal findings:

1. Poor site drainage at the Sawyer Elderly Center – the north parking lot appears to be draining toward the structure.
2. Poor gutter design, material selection, and maintenance – the gutters at the Sawyer Elderly Center are undersized, plastic, and in bad disrepair. Although there appears to be an underground conduit system that the downspouts should be tied into, they are not.
3. Lack of gutters – the two houses that were inspected did not have gutter systems. Although one house had short gutter sections over the doorways, using gutters in this manner can exacerbate water problems.
4. Poorly insulated wall to ceiling junction – one home had mold growth at the exterior wall to ceiling junction. This was likely due to inadequate insulation insulated from the use of low-heel trusses. Properly insulating this area is difficult.
5. Misunderstanding the use of Heat Recovery Ventilation (HRV) systems – the two occupants at the Sawyer Elderly Center that were visited did not use their Heat Recovery Ventilation systems. One occupant thought that it may make her sick and the other simply did not use it. This lack of knowledge about the merits and purpose of the system needs to be addressed. This is an educational issue rather than a technical matter.
6. The one resident used her HRV system, but did not know how to operate it correctly. It appeared that the HRV was having a positive effect on interior conditions.

7. Backing up of septic system – One residence had recurring problems with the septic system backing up into the residence. This was unequivocally the worst problem identified. The inspection team could only speculate why this occurs. The repeated sewage backups contaminated the interior of the home. This problem requires an immediate resolution.

8. Cracked vinyl siding – both the Sawyer Elderly Center and one house with vinyl siding had cracks or holes through the vinyl siding. Clearly, any violation of the siding will allow air and moisture into the wall system.

9. Disconnected dryer vent – one home had a disconnected dryer vent. Dryers that vent to the interior not only significantly increase interior moisture levels, but also contaminate interior air with lint.

10. Electric heat at the Sawyer Elderly Center – Electric baseboards provide the primary heat source at the Sawyer Elderly Center. This form of heating does not provide air circulation and increases the importance of operating the HRV system for fresh air and moisture dilution.

PROGRAMMATIC RECOMMENDATIONS

A particular challenge to all housing authorities is the development of a prompt and effective service delivery system addressing mold and moisture conditions. This requires a partnership between the housing authority and residents. A system could include training for the maintenance staff on how to implement the technical recommendations and training for residents on their roles and responsibilities as renters and homeowners. In many cases, moisture problems develop, but go unreported and unrepaired, which results in avoidable mold contamination. Some strategies include the following:

1. Require attendance at annual homeowner/renter clinics as part of the annual recertification process. Provide instruction on home maintenance issues, such as identifying and repairing leaks, maintaining gutters, operating and maintaining HRV systems, cleanup of minor mold, and more.

2. During the annual recertification process, ask occupants to complete a survey based on Housing Quality Standards (HQS) with additional questions on mold and moisture conditions in their homes. Completing the survey further engages residents in their own home maintenance. Furthermore, the survey responses provide additional information to the housing authority on unreported problems, especially leaks and inoperable fans that might contribute to an unsafe, unhealthy home environment.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Inspection Number	Address	HUD Program	Building Age	Occupancy	Foundation Type	Model and Framing Type	Heat Type	Basement framing moisture content	Site Drainage Problems	Gutter System Problems	Leaks from Exterior	Wet Basement or Crawl Space	Plumbing Problems	Bathroom Problems	Exhaust Ventilation	Exterior wall/ceiling problems	Attic Problems	Visible Mold (Column #)	CFM
1-1	Sawyer Elderly Center	LR	7 Years	16 units	Slab on Grade	Ranch	Electric Baseboard	Slab on Grade	Yes	Yes	No	N/A	No	Yes	Yes	No	No	-	-
1-2	204 Scotty Drive	LR	20 Years	5	Poured Concrete/Basement	Ranch	Propane	Not Taken	Minor	No Gutters	No	No	No	No	Yes	Yes	No	13,17	-
1-3	208 Scotty Drive	LR	20 Years	2	Block Concrete/Basement	Split-Level	Propane	Not Taken	No	No Gutters	Yes	Yes	Yes	Yes	Yes	No	Not Insp.	13,15	-

MH = mutual help TK = Turnkey/Rent to Own LR = Low Rent

Inspection Number: 1-1
Address: Sawyer Elderly Center
Model Type: Ranch
Age: 7 years old
Bedrooms: 1 per unit
Foundation: Slab on Grade
Heat Type: Electric Baseboard
Construction: Wood frame
Attic: Wood Trusses

Figure 1: Sawyer Elderly Center

Building Description: This facility was a senior housing complex with 16 units. Each unit had an exterior entry, kitchen, living/dining area, bedroom and bathroom with a stacked washer drier unit. The wood frame facility was built in 1997 with vinyl siding on the exterior and gypsum board on the interior.

Mold and Moisture Conditions: No mold was on the interior, but mildew grew on the vinyl siding on the north side of the structure, particularly near grade and on the gables (Figure 2).

Figure 2: Downspout draining against building and mildew on siding

Site Drainage: The site was fairly flat and the parking lot on the north side of the building sloped toward the structure. Half the roof also drained to the north side, compounding the rainwater accumulation on this side of the building.

Rainwater Management: The plastic gutter system around the building perimeter had several problems:

1. It was undersized for the drained roof surface area.
2. Inside corner shields that prevented water off the roof valleys from splashing over the outside edge were missing.
3. Several missing downspouts allowed water to saturate the building (Figures 3 & 4).

Figure 3: Missing downspout

Figure 4: Missing downspout

4. One gutter had fallen off the building (Figure 5).
5. Pine needles had accumulated in the gutters (Figure 6).
6. The downspouts drained adjacent to the building rather than being tied into a drain tile.

Foundation Conditions: The foundation was a slab-on-grade. Vinyl siding extended almost to grade, making it impossible to investigate how and if the perimeter of the slab was insulated.

Mechanical Systems: Each unit had a thermostat controlling electric baseboard heating unit and a Heat Recovery Ventilation (HRV) system (Figure 7). The HRV had an intake port in the bathroom and two fresh-air exhaust ports, one near the kitchen and one in the living area. The fresh air intake and exhaust for the HRV was supposedly located in a roof monitor that was not inspected due to the inaccessibility of the attic space.

Figure 5: Missing gutter

Bathroom: Each bathroom had a molded plastic tub/shower unit, vanity, and stacked washer/drier unit. The bathroom exhaust was connected to the HRV system and located near the stacked washer/dryer unit.

Attic: The attic was inspected above a common area only. The attic space was well insulated with foam baffles at the perimeter for attic ventilation. Access to the attic above the living units would have required removal of a lighting fixture and drop-in ceiling grid, so these areas were not inspected.

Figure 6: Gutter full w/pine needles

Occupant Notes: One resident complained that she could not use her bedroom because she became ill whenever she slept there. She suffered no sinus problems when she left the residence for a few days. Her unit had light black wall staining, particularly on the east exterior bedroom wall (Figure 8). The light staining did not appear to be mold. She was a

Figure 7: Air-to-air heat exchanger

Figure 8: Staining on walls in bedroom

smoker and also liked to burn candles. The inspection team suspected the wall staining was primarily environmental tobacco smoke and carbon deposits from burning candles. Further investigation could verify these preliminary conclusions however the fire department came to the same conclusions when they investigated the staining a few months ago.

Another resident said she did not use her air-to-air heat exchanger because she thought that it made her ill.

Discussion / Recommendations:

Water management on the exterior of the structure was a major issue.

1. Replace gutters with appropriately sized gutters that can accommodate the surface area to be drained.
2. Replace gutters with metal commercial grade gutters.
3. Tie the downspouts into a subsurface drain-tile system to conduct the water away from the building.
4. Implement a gutter maintenance regime needs to be to keep the gutters functioning and clear of debris from nearby trees.
5. Divert the parking lot drainage away from the building.

Maintenance of siding:

1. Regularly clean the mildew from the vinyl siding on the north side of the building. Since the north side does not receive direct sunlight, it stays wet and is therefore susceptible to mildew growth. The wet siding tends to collect dust, allowing mildew to grow.
2. Replace the damaged vinyl siding near the base of the house (Figure 9). Compromised siding increases the potential for water entry into the house and accelerated deterioration.

Figure 9: Damaged vinyl siding

Heating and ventilation of individual units:

1. An electric baseboard heating system is not cost-effective. Although it is cheaper to buy and install, the operating costs are higher, unless the Reservation has negotiated a very low electric rate with the local utility company. Furthermore, it does not provide

air circulation which can contribute to mold problems.

2. Relocate the bath exhaust for the HRV system further away from the washer/dryer unit and closer to the bathroom. Its close proximity to the dryer vent results in lint covering and clogging the intake port and setting sucked into the HRV unit polluting the fresh air pumped into the house.
3. The two fresh-air exhaust ports in the units were so close to one another, that neither the bedroom nor the living room area received much air circulation. Relocating the port above the dining area and to a more centrally located area above the living room area would contribute to better ventilation.
4. The Head Maintenance Supervisor stated that the exterior intake and exhaust connection to the HRV was excessively long. The units should have been connected to wall jacks in the gable ends above each living room rather than ducted up to the roof monitor, which reduced the efficiency of the units. This could cut down on the efficiency of the units. However, the inspection team did not inspect the connections because of the inaccessible attic.
5. Maintenance staff should regularly inspect and replace HRV filters.
6. Since the air-to-air heat exchangers draw moisture-laden air out of the bathroom, it is likely that considerable condensation occurs on the heat exchanger surfaces during winter months. Periodic inspect condensate drains for clogs, mold growth, or overflow into the closets.
7. The interviewed residents did not understand the purpose or the operation of the air-to-air heat exchangers. Residents should be educated and trained to turn on the units each time someone baths to ensure proper moisture removal.

Figure 10: Ripped pipe insulation

Other Issues:

1. The slab in one unit appeared to be heaving, since a door that used to clear the carpet now rubbed it. Although unusual, this may have been caused by expansive clays beneath the slab. An accurate diagnosis requires further investigation.

2. Inspect and thoroughly insulate all piping. Pipe insulation on cold water supply lines was poorly installed. Condensation occurs on exposed elbows, tees, and other areas where insulation is missing or ripped (Figure 10 & 11). The condensation drips onto ceiling tiles and other building surfaces, saturating and deteriorating the surfaces, and providing moisture for mold growth.

Figure 11: Exposed plumbing elbow

3. The cloths dryer ducts were routed into the ceiling. However, the team was unable to determine where the dryer vents exhaust due to the inaccessible attic. Duct tape covered one duct where it went into the ceiling. Duct tape is not an effective sealing material. It dries out and becomes brittle. Use aluminized tape and other mastics to seal ducts in lieu of duct tape.

4. The attic hatch to the security system room did not have any insulation on top of it. The only separation between the interior space and the attic was a 5/8" thick piece of drywall. The hatch should have at least four inches of rigid insulation attached to its topside.

Figure 12: Depression next to foundation

5. A depression in the soil was visible on the south side of the building near the east end (Figure 12). Fill in these depressions, since they channel water toward the building which can wet the concrete slab and consequently draw the moisture up into the structure through capillary action.

6. A wet-mop leaned on the drywall above the mop sink in the utility/janitor closet (Figure 13). This practice will allow mold to grow and the drywall to deteriorate. Allow the drywall to dry and then glue Fiber Reinforced Plastic (FRP) to the drywall. Health codes in many communities require the installation of FRP sheeting around mop sinks.

Figure 13: Mop against drywall

Inspection Number: 1-2
Address: 204 Scotty Drive
Model Type: Modular Ranch
Age: 20 years old
Bedrooms: 3
Foundation: Basement w/concrete walls
Heat Type: Gas forced air
Construction: Wood framed
Attic: Blown-in rock-wool Insulation

Figure 1: 204 Scotty Drive

Mold and Moisture Conditions: This home had minor mold growth at the wall to ceiling junction (Figure 2).

Figure 2: Mold at wall to ceiling junction

Rainwater Management: Although the site had the potential for drainage away from the house, the grade at the back of the house sloped toward the residence (Figure 3). There were no gutters on the house.

Figure 3: Grade slopes towards house

Figure 4: HRV & ejector pit

Figure 5: Mold on basement walls

Basement Conditions: The occupant stated that the basement had been fairly damp, but conditions had improved with the installation of an air-to-air heat exchanger, (Figure 4). Mold was growing in one upper corner of the basement wall (Figure 5). This growth was not unexpected since this area of the wall was not insulated and was exposed to exterior conditions Mold is growing on the foundation walls on the top section, since this area would be the coldest and the first area where water would condense on the wall. The rest of the foundation wall was below grade and had 2" rigid insulation next to it.

Exterior Wall/Ceiling Junction: The living and dining areas had mold at the wall to ceiling junction. The mold grew where a truss rested on the top plates.

Bathroom: The bathroom did not have any mold growth. It had a working fan.

Attic Conditions: Access to the attic was through an uninsulated ceiling hatch.

Exterior Siding: The home had vinyl siding installed over old plywood siding. The dryer vent was disconnected from the duct on the exterior of the structure (Figure 6). One piece of siding directly below the exterior water spigot had a crack in it (Figure 7). Staining appeared on the siding beneath the spigot, indicating a leak (Figure 7).

Figure 6: Disconnected drier vent

Figure 7: Cracked siding w/evidence of plumbing leak

Occupant Notes: The house had five occupants, two adults and three children, with another child expected soon. There were no smokers in the house.

Recommendations:

Exterior:

1. Install front and back gutters with leaders directing the water away from the house. This would especially help at the rear of the house where the water currently sheds next to the house and drains back toward the foundation.
2. Install a window well around the rear basement window, add fill material, and recontour the grade to drain water away from the house.
3. Fix the dryer exhaust vent that separated from the wall and replace the existing duct tape with appropriate duct sealing materials.
4. Fix the cracked vinyl siding.

Figure 8: Sump pit w/o sump pump

Interior:

1. The existing sump pit did not have a sump pump (Figure 8). Install a sump pump that drains away from the house.

Figure 9: Standard lumber in direct contact w/concrete

Figure 10: Moisture on window & sash deterioration

2. Insulate the upper two feet of the foundation walls with 2" of rigid insulation to resolve the water condensation problem on the wall.

3. The staircase sidewalls appear to have standard lumber resting directly on the basement slab (Figure 9). Any wood coming in direct contact with concrete should be pressure treated lumber. When these plates deteriorate, replace them with pressure treated lumber.

4. Although the attic appeared to have approximately 10" to 12" of blown-in insulation, increase the insulation at the perimeter of the attic.

Resident Issues:

1. The residents kept a very neat home which helped prevent and reduce mold growth.

2. The occupant did not know how to operate the HRV control panel. Educate the resident on the purpose, operation, and maintenance of the HRV system.

3. Although the windows were replaced recently, they already showed signs of deterioration due to condensation on the glass saturating the lower portion of each sash (Figure 10). The residents should try the following:

   a. Ventilate the house whenever there is an excessive amount of moisture on the interior,

   b. Run the HRV more often or at a higher rate at times of high humidity, or

   c. Buy a dehumidifier to remove the excessive moisture.

Inspection Number: 1-3
Address: 208 Scotty Drive
Model Type: Two-story, split-level.
Age: 20 years
Bedrooms: 3
Foundation: Basement
Heat Type: Gas forced air w/wood stove
Construction: Wood framed
Attic: Not inspected

Figure 1: 208 Scottie Drive

Mold and Moisture Conditions: There was mold in this home, but other problems dwarfed the mold concerns.

Figure 2: Depressions next to foundation

Rainwater Management: The site was relatively flat. There were no gutters on the house except for short front and back door sections. Depressions next to the foundation were probably due to animal activity (Figure 2).

Figure 3: Mold at base of bsmt. wall

Lower Level Conditions: The lower level of this structure was approximately three and one-half feet underground. The hallway and bedroom were carpeted; the bathroom had vinyl tile; and the rest of the basement floors were exposed concrete. The hallway carpet was wet and squishy when walked on. According to the occupant, the septic system backed-up regularly flooding the basement. The area surrounding the floor drain had bits of toilet paper stuck to the floor from previous flooding events. The drywall at the base of the wall close to this area become saturated from flooding events and was currently growing mold (Figure 3).

Lower level bathroom problems:

1. The spigot in the tub leaked with mold growing beneath it (Figure 4).
2. The upper corner above the tub, against the exterior wall, had mold growth (Figure 5).

Figure 4: Mold at the basement tub's spigot

Figure 5: Corner above tub

3. The drywall above the toilet was missing due to a leak in the bathroom above.

4. Mold grew around the base of the walls around the toilet (Figure 6).

Figure 6: Mold at base of wall

Other lower level problems include:

1. The clothes dryer vent was disconnected and vented to the interior (Figure 7).

2. Two penetrations through the walls did not connect to anything (Figure 8). One allows air to flow directly into the interior and the other, a former dryer vent was stuffed with insulation.

Figure 7: Disconnected drier vent

Figure 8: Unattached vents

3. The lower level bedroom window was partially below grade and the window well grade was directly at the base of the window (Figure 9).

Figure 9: Shallow window well

Exterior Wall/Ceiling Junction: No mold grew at the wall to ceiling junction. Even with numerous interior moisture sources, a sufficient amount of air leaking into the structure kept the humidity level low. For example, the exterior door in the dining room had a large gap around the perimeter allowing significant air infiltration. Although large quantities of infiltration are not desirable, the dry exterior air helps keep mold in check.

Bathroom: The upper level bathroom previously had a plumbing leak in the tub valve. During the repair, a drywall nail pierced the water supply piping. The former leak damaged the ceiling of the bathroom below and the new leak was still active.

Attic Conditions: The attic was not inspected.

Exterior Siding: The exterior siding appeared to be a Masonite type product in fairly good condition. One problem was a missing dryer vent which allowed water to infiltrate the wall (Figure 10).

Occupant Notes: The occupant mentioned that his mother had operated a child daycare center in the house until approximately six months ago, but had to move the operation because of the septic problems. No health problems were reported.

Recommendations:

On the exterior of the home:

1. Install gutters on both the front and back of the house with leaders directing the water away from the house. The current short gutter sections, without any downspouts above the two entry doors, directed water next to the house, splashing and saturating the siding.
2. Dig out the area around the lower level windows and install drainage tile, rock and a window well. Only fill the well to within approximately eight inches of the sill of the window.
3. Fix the missing dryer exhaust vent (Figure 10).
4. Fill in the depressions next to the foundation, grade away from the structure and replant with grass.
5. Fix the septic system. Unquestionably, raw sewage backing up into the residence was the largest problem. The occupant stated that currently the septic had to be emptied once a week to prevent back up. This indicated an improperly operating septic system. Without critical analysis, investigators can only speculate as to what the problem may be. The top of the septic system was clearly evident in the backyard (Figure 11). The resident mentioned that the septic system had been worked on several months earlier and had never been properly backfilled. This is part of the problem. A septic system exposed to cold Northern Minnesota climate could freeze and prevent sewage drainage into or out of the system, causing it to back up. If the system continues to back-up once the ground thaws, the system probably has a clogged leach field.

Figure 10: Missing drier vent

Figure 11: Septic tank lid

Home Interior:

1. Remove all carpeting from the lower level and thoroughly clean the entire slab. Resurface the hallway and bedroom with vinyl, composite tile, or sheet goods. Use washable throw rugs in the bedroom.

2. Fix all plumbing leaks.

3. Repair, or if necessary, replace damaged drywall in both bathrooms.

4. Reconnect the dryer vent.

5. Seal unused penetrations through the exterior walls.

6. Repair or replace the door from the dining room to the exterior.

7. Remove all moldy drywall, clean all exposed surfaces, and replace where necessary. Keep the drywall from coming into direct contact with the concrete slab.